

A Compact Safe Cold-Start (CS2) System for Scramjets using Dilute Triethylaluminum Fuel Mixtures, Phase II

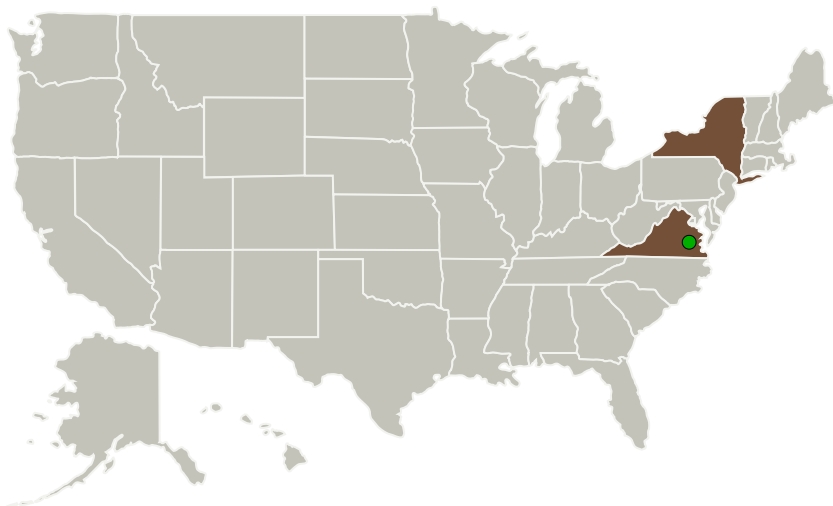
Completed Technology Project (2011 - 2013)



Project Introduction

This proposal leverages a highly successful Phase 1 feasibility effort to further develop a system that satisfies the cold-start requirements of scramjet engines. The system provides energy-dense, low volume hydrocarbon fuel conditioning based on the hydrolysis reaction of triethylaluminum (TEA) with water. TEA is an organometallic liquid that reacts exothermically with water and burns readily in air. In Phase 1, we demonstrated the hydrolysis of TEA in JP fuel within an integrated mixing/injection apparatus to heat and vaporize the liquid hydrocarbon fuel prior to injection in a regeneratively cooled scramjet, as well as auto-ignition of the mixture at elevated TEA concentrations. In Phase 2 we propose to more completely characterize the performance capability of the Phase 1 system using several hydrocarbon fuels to gather data for the design and fabrication of a palletized system. Testing of the palletized system in a direct connect scramjet rig will then be conducted to demonstrate engine ignition capability and to compare the system to other ignition systems under consideration for scramjet vehicles. Packaging in candidate flight vehicles will be carried out using 3D solid modeling to provide gravimetric and volumetric information and to provide designs for practical integrated, safe storage and dispense arrangements.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
ACENT Laboratories LLC	Lead Organization	Industry	Manorville, New York
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
New York	Virginia

Project Transitions

June 2011: Project Start

May 2013: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138607>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ACENT Laboratories LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

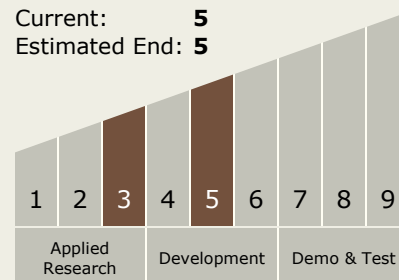
Carlos Torrez

Principal Investigator:

Scott Gallimore

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.3 Aero Propulsion
 - └ TX01.3.2 Turbine Based Combined Cycle

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System